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What are the advantages and disadvantages of quantitative, qualitative and mixed methods when researching the effects of knee osteoarthritis on activities of daily living in older adults?

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Osteoarthritis (OA) is the most common cause of musculoskeletal pain and disability in older adults. The disease is characterized by joint pain, tenderness, limitation of movement (ROM), crepitus, occasional effusion, and inflammation (Kenneth et al, 2008).

The disease processes not only affect the articular cartilage, but also involve the entire joint, including the subchondral bone, ligaments, capsule, synovial membrane, and periarticular muscles (Kenneth et al, 2008; Deyle et al, 2000).

This paper discusses the advantages and disadvantages of quantitative, qualitative and mix methods when researching the effects of knee osteoarthritis in Activities of Daily Living (ADL). The paper will conclude by summarising the key features of each approach and by giving recommendations for the design of the study to be undertaken.

Quantitative designs

Questions focused on the cause, prognosis, diagnosis, treatment and cost of diseases is best answered by quantitative designs (Roberts and Dicenso, 1999; Neill, 2007; DePoy and Gitlin, 1994).

The positivist approach of quantitative or experimental research designs measures “causal relationships between variables” (Howitt and Cramer, 2005, pp.117) in an objective and unbiased manner. For example, this paper aims to measure the relationship between osteoarthritis of knee and functional ability in older adults. The quantitative research is the most rigorous design to determine whether some factor (exposure) causes an outcome and can identify variables of interest in advance. In

addition, quantitative methods are more appropriate if we have a specific hypothesis; and we can operationalise the variables and coping strategies (Howit and Cramer, 2005). The causal relationships between the variables in quantitative designs can be measured by experimental hypothesis (Neill, 2007). For instance, (Penninx et al., 2001) measured the causal relationship between physical exercise and prevention of disability in older adults with OA knee. Wherein the authors conclude that extensive exercise programme reduce disability in patients with OA knee and this, improve their activity of daily living (ADL).

Quantitative designs are objective and study precise measurement (DePoy and Gitlin, 1994). For instance, Penninx et al, (2001) have studied the efficacy of exercise on prevention of ADL in patients with OA knee however; this method may miss contextual details (Neill, 2007).

In addition, internal validity, external validity can have effects on reliability of evidence produced, for instance, in a RCT, (Deyle et al, 2000) lack of a second treatment group for applying only knee exercise have affected the outcomes, and this can be another disadvantage of quantitative designs (Campbell and Kerlinger 2007; DePoy and Gitlin, 1994). Furthermore, (Roberts and Dicenso, 1999) state that quantitative design can be costly and time consuming projects and may, therefore not be appropriate unless funding can be secured.

The Randomised Controlled Trial (RCT) is the strongest quantitative design for questions of whether healthcare interventions are beneficial (ie, do more good than harm (Roberts and Dicenso, 1999; DePoy and Gitlin, 1994). An RCT is a true experiment in which people are randomly allocated to receive a new intervention

(experimental group) or to receive a conventional intervention or no intervention at all (control group) (Roberts and Dicenso, 1999). Because it is, the play of chance alone that determines the allocation the only systematic difference between the groups should be the intervention, which increases the validity of the study by removing likely bias (Roberts and Dicenso, 1999; DePoy and Gitlin, 1994).

Investigators follow participants forward in time (follow up) by measuring the dependant variables and then assess whether they have experienced a specific outcome (Roberts and Dicenso, 1999). For example, the baseline knee extensor strength as dependant variable was significantly lower among women who had no radiographic evidence of knee OA at the initial examination but who had developed OA changes some 30 months later than in women who did not develop radiographic changes of OA (Roberts and Dicenso, 1999).

Standardised questionnaires have been used to measure pain and functional ability (Brandt, 1997; DePoy and Gitlin, 1994). The Western Ontario McMaster Osteoarthritis index (WOMAC) is a validate questionnaire, producing nominal data, which can be analysed statically using non-parametric tests. WOMAC produce measurements for pain, stiffness and difficulty in subjects with OA and has been consistently used in each of the RCT's mentioned above. For instance, Deyle et al, (2000) have used WOMAC to measure the pain and disability variables in patients with OA knee and used 6- minute walking test to measure the effect of manual therapy and exercise. There are occasions, however, when the evaluation of an intervention using an RCT is not ethical or feasible. In this case, we must rely on a less rigorous design such as the cohort analytic study (also known as a controlled

trial). This study design is similar to the RCT in which there are comparison groups who receive and do not receive an intervention and they are followed up to determine who experiences the outcome of interest (Roberts and Dicenso, 1999).

When the outcome of interest is rare or takes a long time to develop, neither RCTs nor cohort analytic studies may be feasible (Roberts and Dicenso, 1999; Howitt and Cramer, 2005). In these circumstances, a case control design is more suitable to study the OA knee.

In a case control design, patients with the outcome of interest (cases) and patients without the outcome of interest (controls) are identified and then the investigator determines whether they have had previous exposure to the causative agent. For instance, investigating the risk factors for OA knee in women, including wearing of high-heeled shoes, can best be studied by case control design. The investigator is able to match the case (OA knee patients) and control group on important variables that may influence the outcome (e.g., age, sex, and other health conditions).

Qualitative designs

Since much of physiotherapy is concerned with understanding and affecting the function and roles of persons in their communities, the possible contributions of qualitative research to care and policy are significant (Morse and Field, 1995).

Qualitative research is a useful approach to explore perplexing or complicated clinical situations (Beaton and Clark, 2009). For example, (Pendleton et al, 2005) indicate that an effective, exercise programmes should include advice and education to promote a positive lifestyle change for patient with OA knee. Qualitative research is generally based on non-probability and purposive sampling rather than probability

or random approaches (Ploeg, 1999). Questions about the meaning or experience of OA knee are best answered using qualitative designs (DePoy and Gitlin, 1994; Beaton and Clark, 2009). The purpose of qualitative research is to describe, explore, and explain phenomena being studied. For example in this study qualitative research questions can take the form of how evidence based exercise programmes, can affect the social life of patients with OA knee?

Many data collection techniques are used in qualitative research, but the most common are interviewing and participant observation (Beaton and Clark, 2009) and journals, newspapers, letters, books, photographs, and video tapes (Morse and Field, 1995). In addition, unstructured interviews are used when the researcher knows little about the topic, whereas semi-structured interviews are used when the researcher has an idea of the questions to ask about a topic (Campbell, Kerlinger, 2007).

Although the qualitative research is a valuable source of knowledge but because of its unique focus and methodological approach, it cannot be evaluated according to the rules of levels of evidence or meta-analysis developed for quantitative studies. As a result, there is the potential for qualitative research to be undervalued or inappropriately relegated to a 'lesser' status of research if these evaluation methods are practised inappropriately or exclusively (Gibson and Douglas, 2002).

The most commonly used approaches to qualitative research are phenomenology, ethnography, and grounded theory (Ploeg, 1999; Field, 1995).

The aim of a phenomenological approach to qualitative research is to describe accurately, the lived experiences of older adults with OA knee and not to generate theories or models of the phenomenon being studied (Morse and Field, 1995).

Ethnography is another approach to qualitative design. The goal of ethnography is to learn about a culture from the people who actually live in that culture (DePoy and Gitlin, 1994; Morse and Field, 1995). In addition, ethnography is characterized by intensive, ongoing, face-to-face involvement with participants of the culture being studied and by participating in their settings and social worlds during a period of fieldwork (Ploeg, 1999). For example, when researching the life experience of a white OA patient living in Africans country amongst black population, ethnography can be appropriate methodology.

In addition, grounded theory can be used when researcher like to discover social-psychological processes (DePoy and Gitlin, 1994; Chenitz, and Swanson, 1986) and develop a theory from a body of evidence, rather than verifying theories. For instance, Gignac and Cott, (1998) have used grounded theory to explore the meaning of dependence and in-dependence for older adults with disability. Their in-depth analysis of the nature of independence and dependence informs physiotherapists by providing a comprehensive description of the ways that patient interpret and cope with the condition (Gignac and Cott, 1998).

Finally, by integrating qualitative research results such as Gignac and Cott, (1998) into practice, physiotherapists are more likely to understand what matters most to individuals and will be better equipped to work collaboratively with their patients, when formulating policy, or in establishing best practices.

Mix methods designs

Combining qualitative and quantitative approaches can result in a rich data set that provides multiple sources of information to address the research question (Campbell and Kerlinger, 2007; DePoy and Gitlin, 1994; Ploeg, 1999). In addition, by combining quantitative and qualitative methods we can answer multiple research questions, elaborate our findings and confirm the results (triangulation). However, mixed methods may have some disadvantages like contradictory of results, conflict between epistemological paradigms, cost and time consuming.

Gibson et al., (2002) have combined quantitative survey, qualitative interviews and philosophical methods (examining competing arguments for logical validity and internal consistency) to examine practice and draw normative conclusions. The survey provided a summary of national practices and attitudes, while the interviews allowed for in-depth exploration of the meaning of terms such as 'quality of life' and 'futility' that would be otherwise difficult to capture, but were critical to the philosophical exploration (Gibson et al., 2002). In addition, in mix method, qualitative studies complement the limits of quantitative work because they can explicate deeper meaning and complexity associated with questions such as why OA patients decline joint replacement surgery, why they do not adhere to pain and exercise regimens, and why providers do not always provide evidence-based care (Beaton and Clark, 2009). Furthermore, conducting qualitative studies (interviews or focus group) prior or alongside the experimental study will add depth of understanding to the patient experience.

Nevertheless it is obvious that the needs for qualitative and mix method approach is essential to explore the meanings and experiences of subjects living with OA knee. Furthermore combining the experiences of qualitative designs with the experimental research can address many questions about OA that not have been answered adequately.

Conclusion

It is obvious that each research method have its strengths and weaknesses in producing clinical evidence, recommendations and guidelines. To date, the most commonly used forms of research regarding osteoarthritis and its effects on ADL have arisen from quantitative or experimental design. Although, RCTs are the most robust and reliable form of experimental research design, which can measure the effects of OA knee on the ADL, however this approach may not be sufficient to identify the specific needs of the range of client group physiotherapy encounters. Therefore, a more balanced design of research is encouraged where qualitative and quantitative designs are used to complement each other.

Surprisingly, none of the above studies has researched the long-term effect of osteoarthritis on ADL in older adults. Therefore, the author suggests that the future studies may investigate the effects of OA knee on patient's ADL beyond 1-year. Since the quantitative method in long term is time and cost consuming, therefore the qualitative method would be appropriate design to find the answerer of many unsolved question about the effects of osteoarthritis on patient's feeling, social and leisure activities in long term. *-----*

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